THE NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS' "NAHM" SNAG RESISTANCE TESTER

By
Howard E. Shearer and E. Max Schenke

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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
WASHINGTON

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INTRODUCTION

This letter circular describes the "NAHM" device for testing snag resistance of fabrics and the recommended testing procedure. The methods of recording results and reporting snag resistance are shown. Results of tests of typical stockings are given to illustrate the interpretation of the report.

The device was developed recently at the National Bureau of Standards by Howard E. Shearer, Research Associate, and E. Max Schenke, Director of Research, for the National Association of Hosiery Manufacturers. Application has been made for a patent which will be assigned in trust to the Secretary of Commerce in order that the device may be made available without payment of royalties. Under this patent the device will be known as the "NAHM Snag Resistance Tester." Those desiring to manufacture or use the NAHM Snag Resistance Tester will be required to obtain a non-transferable, non-exclusive license from the Secretary of Commerce and to give satisfactory assurance that the construction and method of carrying out the test conform to the specifications recommended by the National Association of Hosiery Manufacturers and approved by the Secretary of Commerce.

The test should be helpful to manufacturers in determining and controlling the factors which are of importance in manufacturing stockings as resistant to snagging as possible. The device should be of value to all hosiery testing laboratories.

DESCRIPTION

The NAHM Snag Resistance Tester is shown in the accompanying photograph. It consists of a flat duralumin hosiery form, A, of standard dimensions[1] on which the stocking to be tested is mounted with the seam in a groove along one edge.

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[1] The dimensions of this form are given on page 10 of National Bureau of Standards circular C422, "Methods of Testing Hosiery". It may also be used for the counting of wales, courses, etc., as described therein.

The center of the form, B, is cut out and holds a binder's board insert which is covered with a fresh surface of white chart paper for each test. A chromium plated clamp, C, attached to the welt of the stocking, is arranged by means of a weight, D, to hold the stocking taut on the form. The snagging mechanism E, is essentially a smooth conical point that is lowered by means of a micrometer through a hollow supporting disc to definite known distances below the base of the disc. The disc is of chromium plated bronze. The standard point to be supplied with the device is made of a deep case hardened steel[2].

The disc of the snagging mechanism fits into a hole in the cross slide, F, and rests upon the stocking. The sliding carriage, G, which carries the cross slide, permits the snagging mechanism to be moved lengthwise of the stocking over the area which is backed with the paper and binder's board. It can be shifted widthwise of the stocking by means of the cross slide. The cross slide is of a transparent synthetic resin which allows a clear view of the snagging area. The carriage is supported by means of a flat rectangular frame, H, which is placed over the hosiery form, and rests upon the same horizontal surface. A table covered with a piece of plate glass is recommended.

TEST PROCEDURE

The stocking to be tested is pulled over the hosiery form and the inserts slipped into position in the large recess therein. The inserts are a sheet of 100% rag white chart paper 0.0070" thick complying with U. S. Government Printing Office specifications lot 69, placed over a sheet of No. 1 quality binder's board 0.110" thick. Care should be taken to see that these inserts are free from wrinkles and that they have no perceptible curvature.

The clamp is laid across the welt of the stocking, the upper edge of the welt is turned back over the lip of the clamp, and secured by means of a slide and lever. The clamp is then turned over flat on the upper end of the hosiery form, and a 2-pound weight is attached, so as to hang freely over the end of the form, and hold the stocking taut with its seam in the groove at the back of the form.

The assembled frame is then placed over the hosiery form, as shown in the picture, with the straight edge of the

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2 An adapter is available in which a new medium phonograph needle is inserted for each test. This point produces greater snagging than the standard point, and is used only when fabric having exceptionally high snag resistance is being tested.

form away from the operator, and the long side of the main frame against it. The scales on the main frame and sliding carriage should face toward the operator.

The sliding carriage is drawn to the operator's left and the cross slide set so that its center line corresponds with the No. 1 position on the left-hand scale on the sliding carriage.

The snagging mechanism is placed on a hard flat surface, such as a piece of plate glass, and the head on the micrometer is slowly turned until contact of the snagging point with the flat surface is indicated. This is the initial or zero setting of the snagging point. With this setting recorded, the snagging mechanism is inserted in the opening of the cross slide so that the disc rests freely of its own weight upon the stocking fabric.

One of the center knobs on the carriage is firmly grasped and the carriage is moved the full length of the main frame and back. A moderate rate of speed of approximately ten inches per second is used. If there is no indication of snagging, the point is lowered 0.002" and the movement repeated. The lowering of the point in increments of 0.002" and movement of it over the stocking at this No. 1 position are repeated until at least slight snagging occurs. The cross slide is then shifted widthwise of the stocking to the No. 2 position on the scale. The point is lowered 0.002" further than at its last setting and the snagging mechanism is drawn over the stocking and back again as before. If no hole is produced in the stocking, the carriage is shifted to the No. 3 position, the point again lowered 0.002" and the snagging cycle repeated. This shifting and lowering of the point is continued until one or more holes are produced. The number of holes produced at some one setting of the micrometer must be sufficient to give an average of at least one hole per surface tested. See table I.

The form with the stocking on it is then turned over, and with a fresh surface of the chart paper in the recess, the test is repeated in a similar manner using the right-hand scale on the cross slide. A fresh piece of chart paper must be used for each stocking, though the binder's board may be used for a number of tests so long as its surface shows no perceptible curvature, or impression from the snagging point.

TABULATION OF DATA

The accompanying data sheet, Table I, shows the method of recording information obtained in this test. Only the mid ten inch length of the tested surface is considered. The

number and type of snags occurring at each micrometer setting is recorded for each side of three stockings. This may conveniently be left until the completion of the entire series of movements on one side of the stocking by merely marking the scale number on the fabric for each movement as it is made, and after the final movement, counting the snags in each movement for the entire series. A black paper insert temporarily slipped beneath the fabric usually will be found helpful in counting the snags.

The snags are classified as "light snags" where there is a mere dislocation or spreading of the stitch; "snags" where open or wide spread stitches result; "looped snags" where the stitches are pulled and the yarn looped above the surface of the fabric; "holes" where the yarn is actually broken.

The sum of the snags in each of these classifications is divided by the number of surfaces tested to obtain the average number produced at each setting of the micrometer point. Fractions of a snag are converted to the equivalent in the next minor classification on the arbitrary basis of two light snags being the equivalent of 1 snag, two snags the equivalent of one looped snag, and three looped snags the equivalent of one hole.

A single numerical value is then obtained by converting the average number of snags of each type to the predominant type using the same arbitrary basis. This gives a single numerical value representing the number of snags on the basis of the predominant type. Fractions are disregarded in reporting this result. The numerical value obtained, in this way, indicates the relative susceptibility of the stocking to snagging and is hereafter referred to as the "ease of snagging".

The "Snag Index" is the average of the depths in thousandths of an inch to the nearest thousandth, that the snagging point penetrated each of the surfaces tested to produce the first hole. It is reported as a whole number. In calculating the "Snag Index" it is the first hole which is considered, not the number of holes. This is based on the theory that a stocking is generally considered to be serviceable, even though snagged, until a hole is formed which will allow a runner to start. When this occurs the stocking is generally discarded, or must be repaired, whether there are one or many holes. The method of averaging out the snags and of arriving at the Snag Index number has been found most satisfactory over a wide range of samples.

The average of the results obtained at each micrometer setting for the two sides of three stockings usually gives a clear indication of the resistance to snagging of that type of stocking. If results for a greater or lesser number of stockings are averaged, note should be made of this in the report.

The data given will illustrate the variations that may be encountered when testing a group of three stockings. Slight variations in the finish, stitch construction, or texture, as are to be found between stockings of the same group, will give rise to this variation in snagging. Occasionally stockings of a group will be found wherein the point of initial snagging varies by 0.002". It is not unusual for the setting at which a hole first appears in a group of stockings to vary by 0.002". Occasional variations of 0.004" are found in this respect. The data given in Table II show the duplication of results when a test of three stockings from a given lot was repeated after 3 weeks.

PREPARATION OF REPORT

Table III illustrates the method of reporting snag resistance. The report is divided into two sections. Under "Ease of Snagging" is listed the calculated number and predominant type of snag obtained at each penetration of the snagging point. This section enables one to quickly see which group of stockings is apt to snag most readily; the type of snag most likely to occur, that is, whether the snag is a mere opening up of the stitch or a much more objectionable looped thread; and whether the stocking is apt to break into a series of holes. Special significance may be attached to the predominant type of snag produced and the depths of penetration at which snagging and holes first occur.

The second section gives one figure, the "Snag Index" which represents the resistance of the group to destructive snagging or the production of a hole through snagging. A high index number is desirable. This number has been found to be generally representative of the snag resistance of stockings, but a more complete and instructive picture of the snag resistance properties is obtained by also taking into consideration the "Ease of Snagging". It sometimes happens that a group of stockings which are more susceptible to light snagging are less susceptible to heavy snagging, and have a higher "Snag Index" than another group.

This method has been found to give a good indication of the comparative resistance of stockings to snagging in a condensed, informative, and easily understood style.

DISCUSSION OF REPORT

The groups of stockings represented in the "Report", Table III, have been selected to give some idea as to how changes in the manufacture will affect the snag resistance measured with the NAHM tester. The data for group A are given in detail in Table I. From the manufacturing viewpoint Groups A and B vary only in respect to the amount of twist. Group C is of the same construction as Group B, but has been given a special finishing treatment. Group D is of much the same general construction as Group B except that it is made from a different type of fiber.

A comparison of the four groups shows only Group D to snag at a penetration as low as 0.006". This indicates that stockings of this type may be expected to be more susceptible to light snagging than those of the other groups. Group D stockings possess a greater resistance to heavy snagging and to destructive snagging than Group A. Of groups A, B, and C, Group A appears to be the most susceptible to light snagging as well as to destructive snagging. Changing the twist as in Group B increases the overall snag resistance. Applying the special finish as in Group C does not appear to improve the resistance to light snagging but does improve its resistance as the snagging becomes more severe. The yarn of Group C loops up decidedly under severe snagging but strongly resists the production of a hole.

On the composite basis of "Ease of Snagging" and "Snag Index" we would place these particular groups in the following order of preference: Group C, Group B, Group D, Group A. This happens to follow the order of decreasing Snag Indices, though this will not always be so for other stockings.

Test No.: 0000
Date: 6/5/39
Tested by:HES

Table I

DATA SHEET

Stocking Construction: X thread silk, Y gauge, Z turns right, Q finish.

Initial Micrometer Setting: 0.285

Test Samples			Micrometer Setting - 0.277 Penetration of Snagger - 0.008"					
Stocking No.	Side No.	Scale Position.	Light Snags	Snags	Looped Snags	Holes	Total	Snag Index
1	1	1	6	3	0	0	9	--
1	2	1	7	2	0	0	9	--
2	1	1	6	4	0	0	10	--
2	2	1	8	1	0	0	9	--
3	1	1	3	3	0	0	6	--
3	2	1	6	1	0	0	7	--
		Total:	36 plus 2X2	14	0	0	--	--
		Average:	7	2	0	0	--	--

No. of snags on basis of predominant type: 7 + (2 X 2) = 11 light snags

Test Samples			Micrometer Setting - 0.275 Penetration of Snagger - 0.010"					
Stocking No.	Side No.	Scale Position.	Light Snags	Snags	Looped Snags	Holes	Total	Snag Index
1	1	2	11	27	4	0	42	--
1	2	2	9	33	4	1	47	10
2	1	2	3	20	10	2	35	10
2	2	2	2	18	10	1	31	10
3	1	2	10	28	2	0	40	--
3	2	2	11	21	0	0	32	--
		Total:	46 plus 3X2	147	30 plus 4X3	4	--	--
		Average:	9	24	7	0		

No. of snags on basis of predominant type: 24 + 9/2 + (7 X 2) = 43 snags

Test No.: 0000
Date: 6/5/39
Tested by: HES

Table I

DATA SHEET
(cont'd)

Stocking Construction: X thread silk, Y gauge, Z turns right, Q finish.

Initial Micrometer Setting: 0.285

Test Sample			Micrometer Setting - 0.273 Penetration of Snagger - 0.012					
Stocking No.	Side No.	Scale Position.	Light Snags	Snags	Looped Snags	Holes	Total	Snag Index
1	1	3	1	12	25	2	40	12
1	2	3	1	10	23	3	42	10
2	1	3	0	5	23	5	33	10
2	2	3	0	8	20	4	32	10
3	1	3	0	15	15	1	31	12
3	2	3	2	18	12	1	33	12
		Total:	4 plus 2X2	68 plus 3X2	123 plus 4X3	16	--	66
		Average:	1	12	22	2	--	11

No. of snags on basis of predominant type: 22 + 1/4 + 12/2 = 28 looped snags, 2 holes

Remarks: Long runs extend from each hole.

Note: In calculating the averages, and the number of snags on the basis of the one predominant type remember that: 1 hole is the equivalent of 3 looped snags; 1 looped snag is the equivalent of 2 snags; 1 snag is the equivalent of 2 light snags. Any number in the totals not evenly divisible by the number of determinations (6) is converted to the next minor type of snag.

Table II

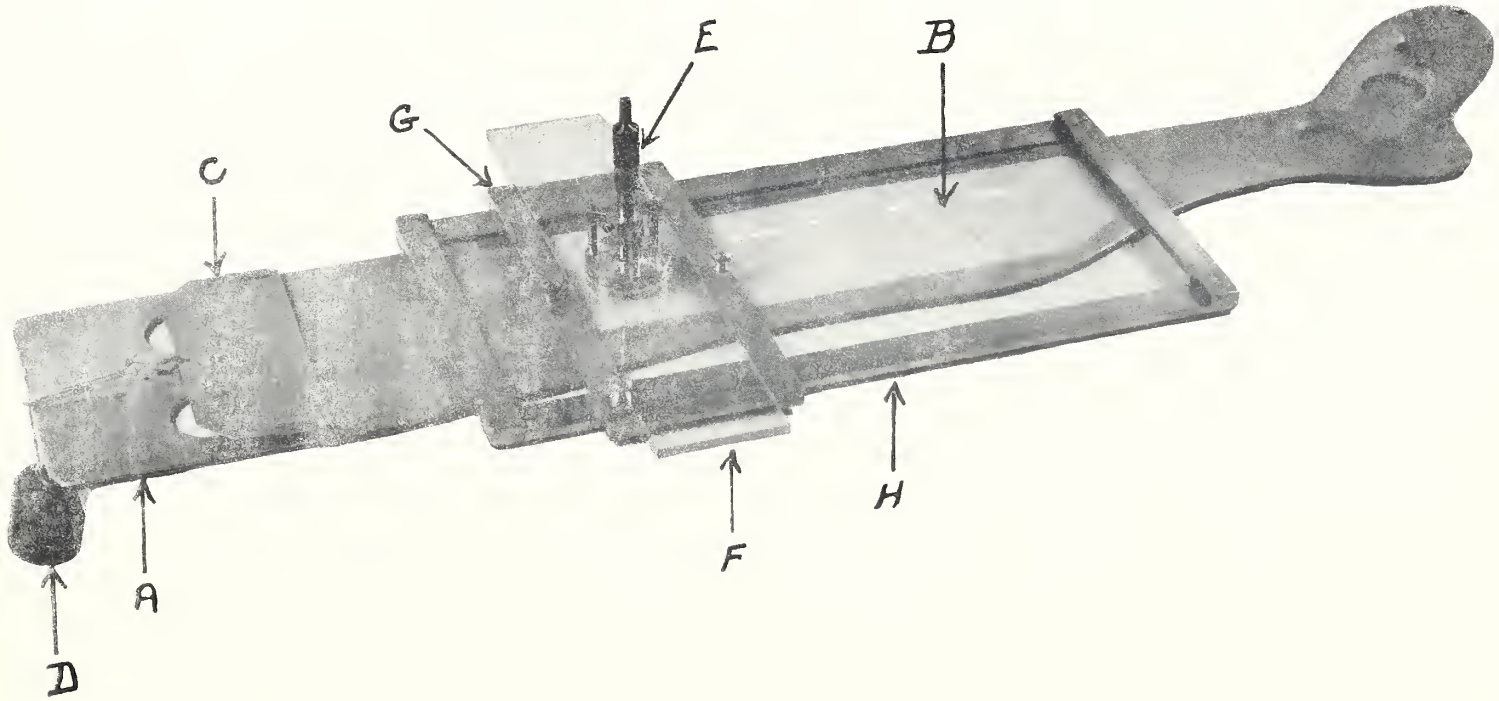
Duplication of results

Average for three stockings tested in each group.

Penetration of Snagger	Tested 12/20/39	Tested 2/14/40
0.000"	1st contact	1st contact
0.002	contact	contact
0.004	"	"
0.006	4 light snags	8 light snags
0.008	50 light snags	43 light snags
0.010	56 snags	51 snags
0.012	73 snags.	75 snags
0.014	40 looped snags, 1 hole.	36 looped snags, 1 hole.
	Snag Index	
	12	12

Table III
The
N.A.H.M.
SNAG RESISTANCE TEST
REPORT

Penetration of Snagger	Ease of Snagging			
	Group A	Group B	Group C	Group D
0.000"	1st contact	1st contact	1st contact	1st contact
0.002	contact	contact	contact	contact
0.004	"	"	"	"
0.006	"	"	"	3 light snags
0.008	11 light snags	1 light snag	4 light snags	20 light snags
0.010	43 snags	15 snags	18 snags	37 snags
0.012	28 looped snags, 2 holes.	37 snags	29 snags	43 snags
0.014	-----	21 looped snags	31 snags	47 snags
0.016	-----	22 looped snags, 1 hole.	15 looped snags	26 looped snags 1 hole.
0.018	-----	-----	16 looped snags	-----
0.020	-----	-----	18 looped snags	-----
0.022	-----	-----	20 looped snags	-----
0.024	-----	-----	21 looped snags, 1 hole.	-----
	Snag Index			
	11	17	23	15


E
B
G
C
H
F
A
D